

FIG. 1

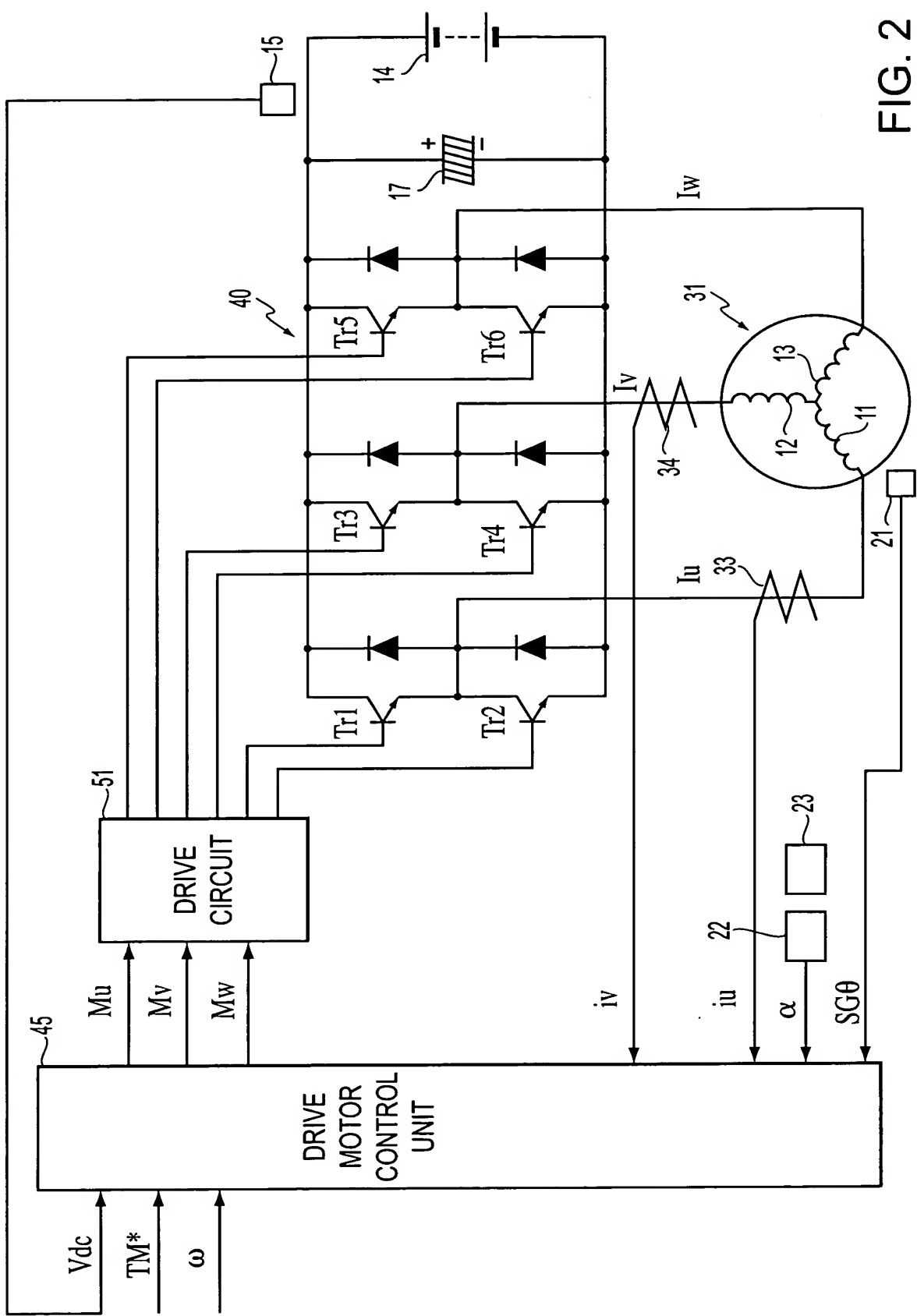
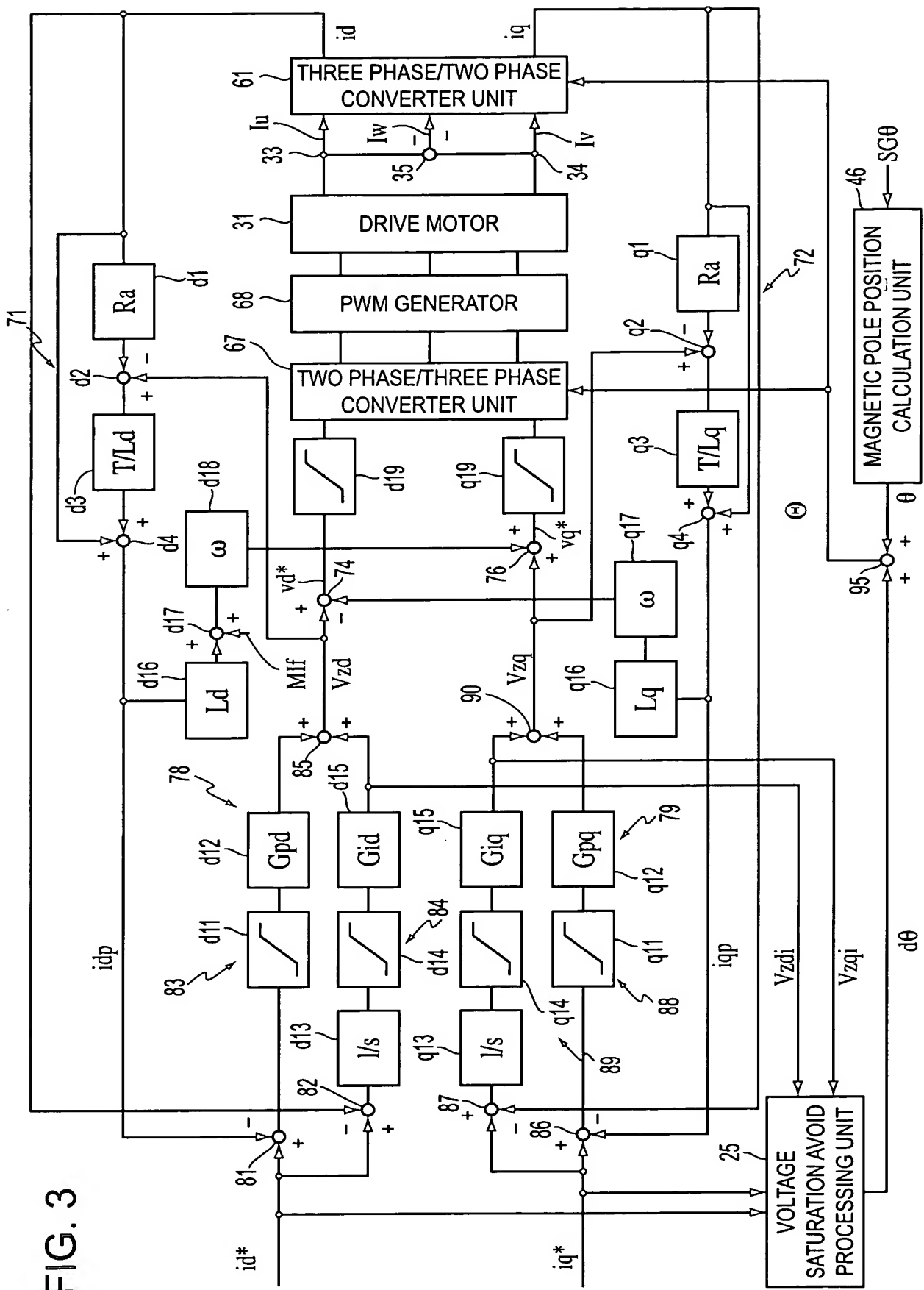


FIG. 2

The diagram illustrates a motor control system with the following components and signal flow:

- Reference Inputs:**  $i_d^*$  and  $i_q^*$  are the reference currents.  $\theta$  is the magnetic pole position, and  $SG\theta$  is its derivative.
- Current Feedback Loop (Left):**
  - $i_{dp}$  is the feedback current.
  - Summing junction  $d1$  calculates  $i_d^* - i_{dp}$ .
  - Block  $T/L_d$  (d2) and integrator  $1/s$  (d13) process this error.
  - Summing junction  $d3$  calculates  $i_d^* - i_{dp} - \omega \lambda$ , where  $\omega \lambda$  is the back-EMF component.
  - Block  $L_d$  (d16) and summing junction  $d4$  produce the reference  $i_d$ .
- Current Feedback Loop (Right):**
  - $i_{qp}$  is the feedback current.
  - Summing junction  $q1$  calculates  $i_q^* - i_{qp}$ .
  - Block  $T/L_q$  (q3) and integrator  $1/s$  (q13) process this error.
  - Summing junction  $q4$  calculates  $i_q^* - i_{qp} - \omega \lambda$ .
  - Block  $L_q$  (q16) and summing junction  $q2$  produce the reference  $i_q$ .
- Control and Conversion:**
  - PWM GENERATOR (68):** Receives  $i_d$  and  $i_q$  to generate PWM signals.
  - TWO PHASE/THREE PHASE CONVERTER UNIT (67):** Converts the reference currents into three-phase voltage commands  $v_d^*$  and  $v_q^*$ .
  - THREE PHASE/TWO PHASE CONVERTER UNIT (61):** Converts the three-phase motor currents  $i_u, i_v, i_w$  back into  $i_d$  and  $i_q$ .
- Motor and Feedback:**
  - DRIVE MOTOR (31):** Receives the three-phase voltages and provides feedback currents  $i_u, i_v, i_w$ .
  - MAGNETIC POLE POSITION CALCULATION UNIT (46):** Integrates  $SG\theta$  to provide  $\theta$ .
  - VOLTAGE SATURATION AVOID PROCESSING UNIT (25):** Processes the voltage commands to avoid saturation, outputting  $V_{zd}$  and  $V_{zq}$ .
  - Back-EMF Calculation (78):** Uses  $\omega$  and motor parameters to calculate  $\omega \lambda$ .



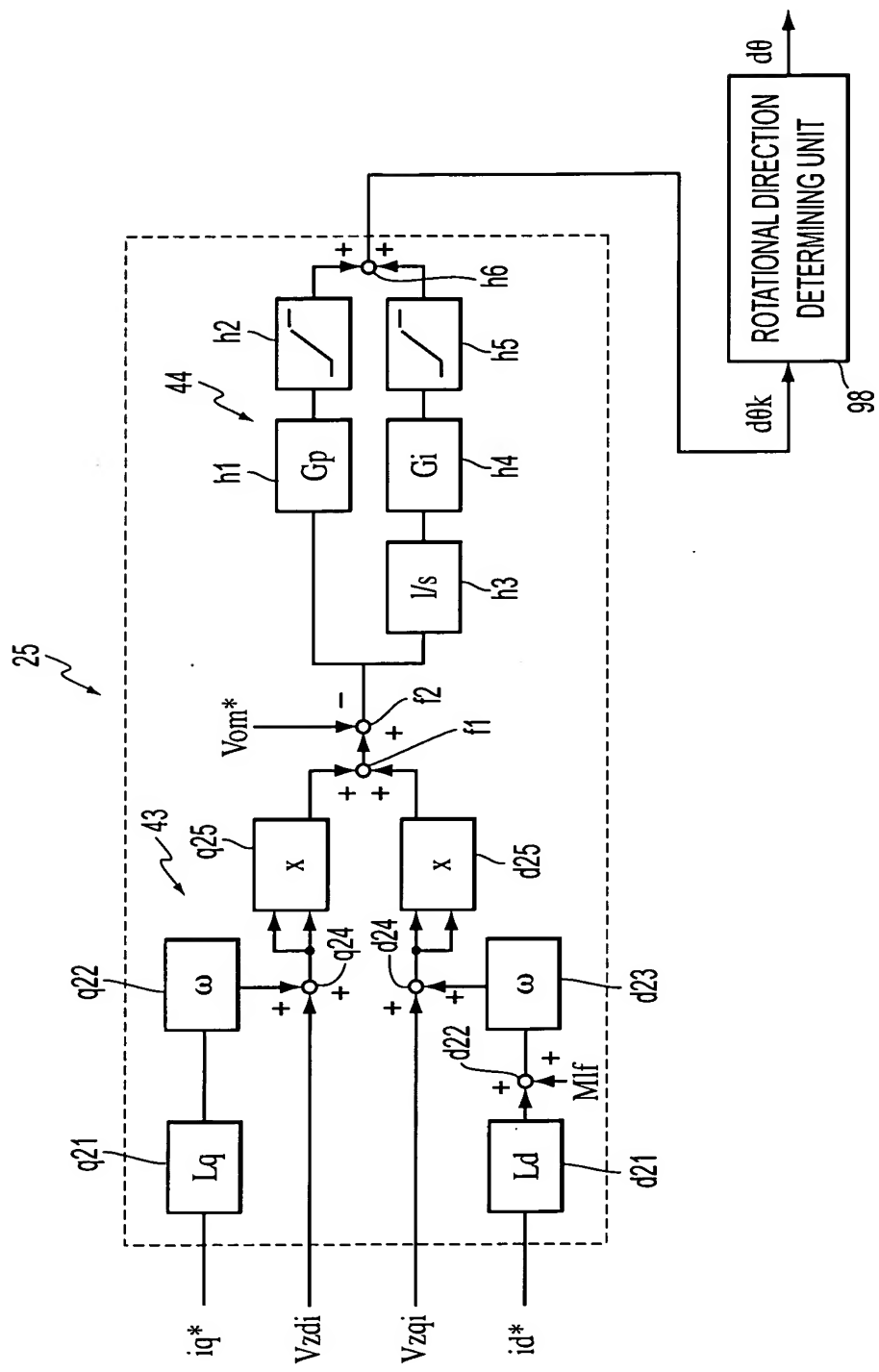


FIG. 4

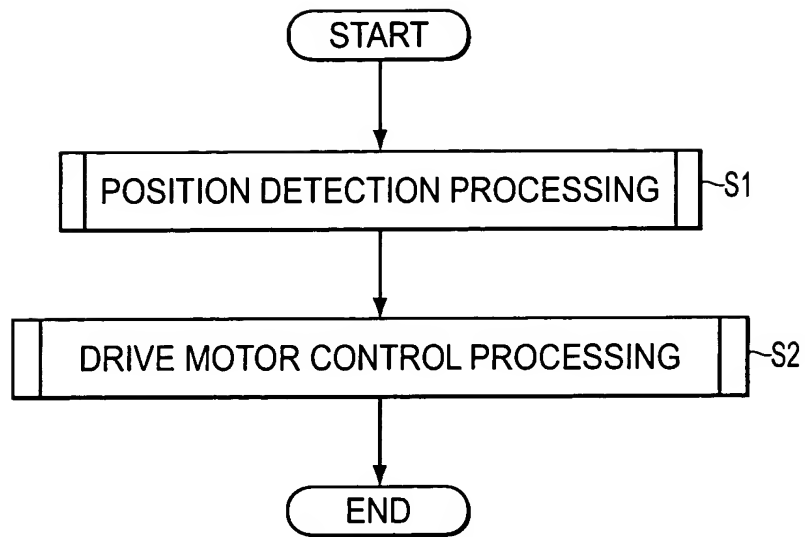


FIG. 5

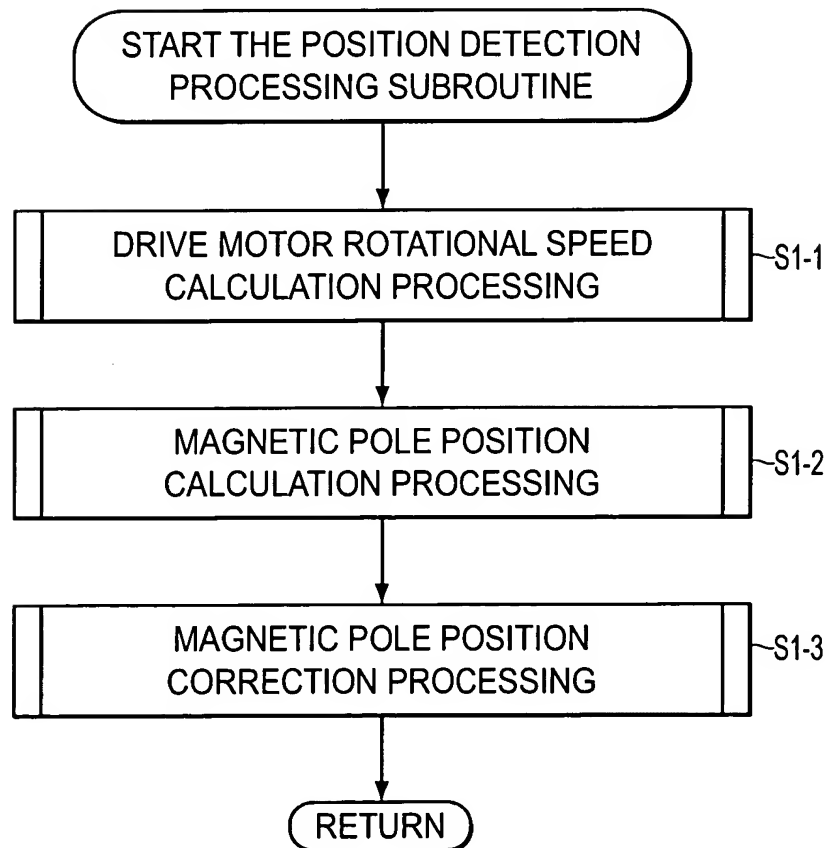


FIG. 6

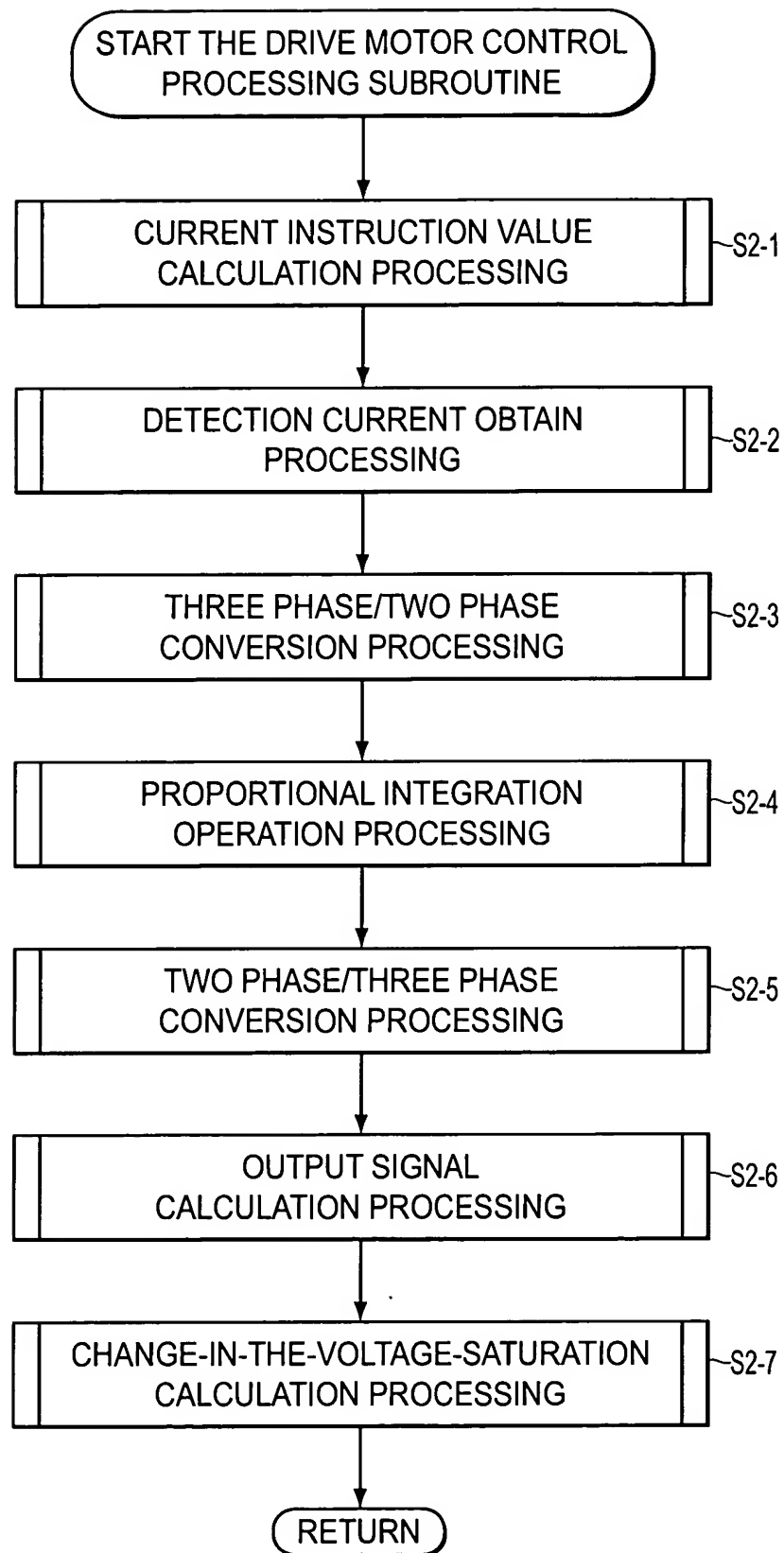


FIG. 7

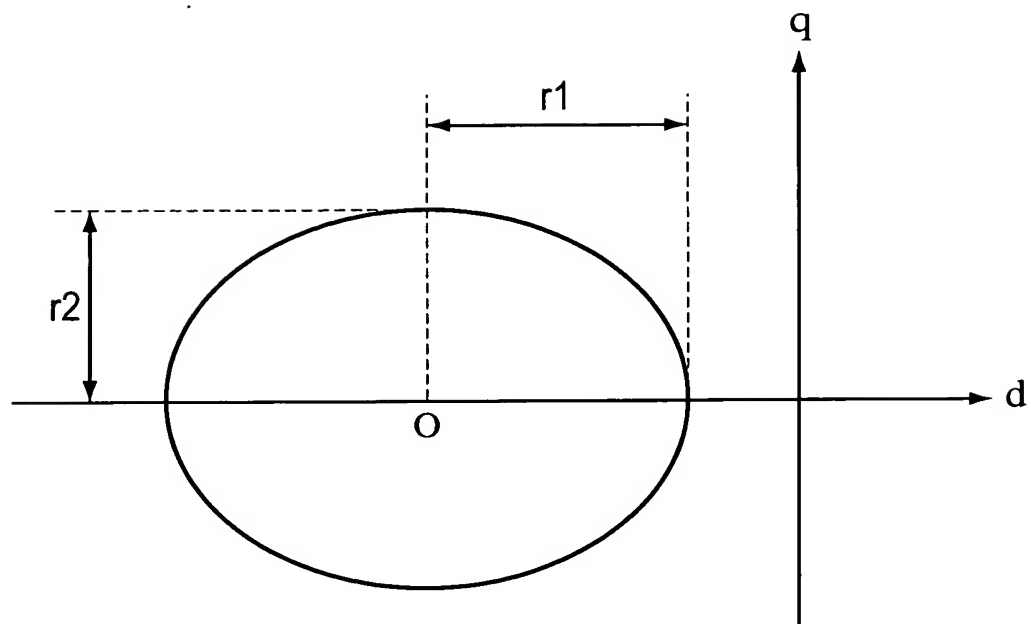


FIG. 8

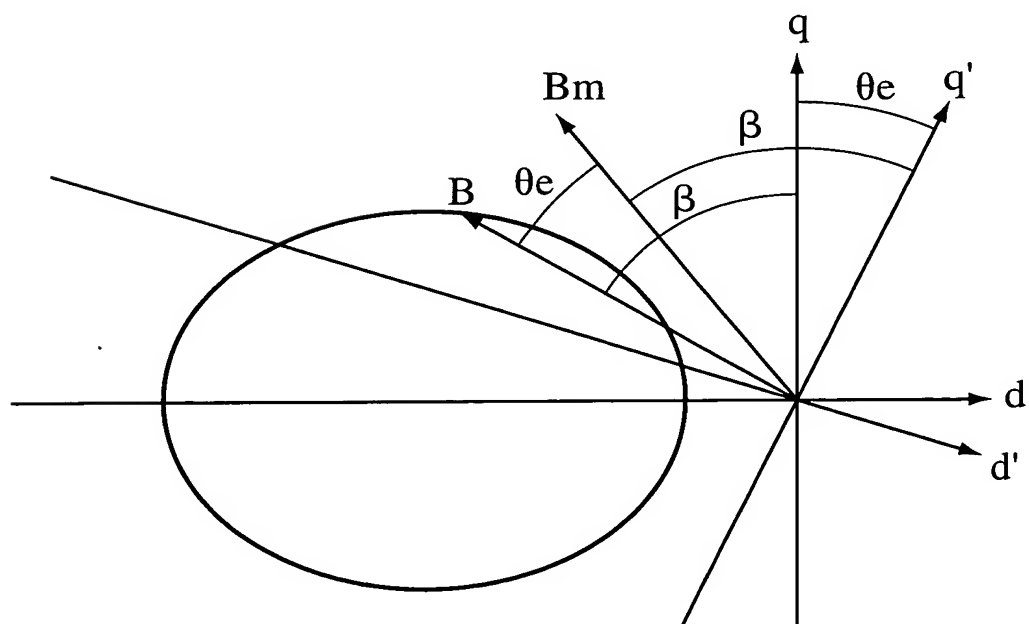
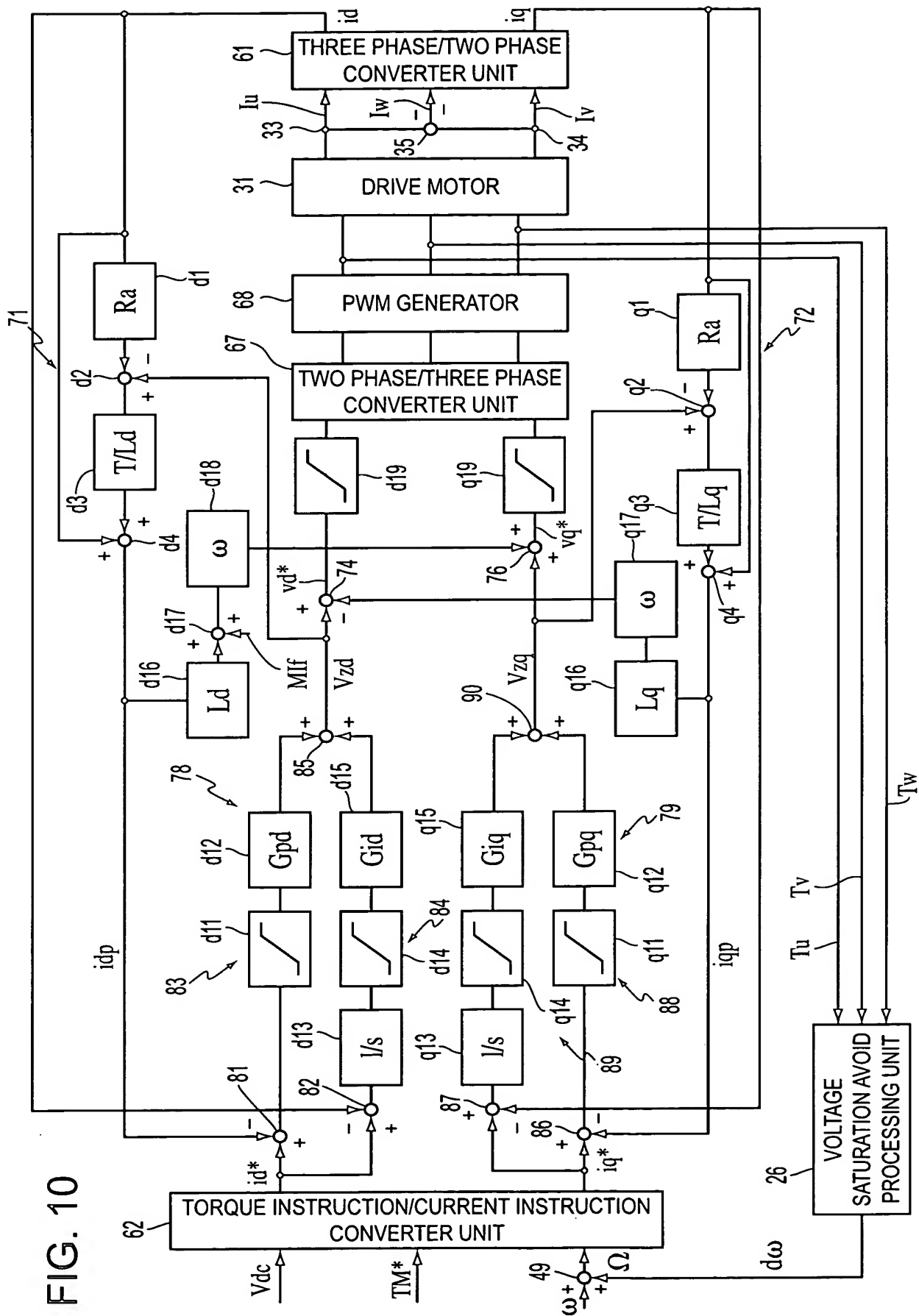


FIG. 9





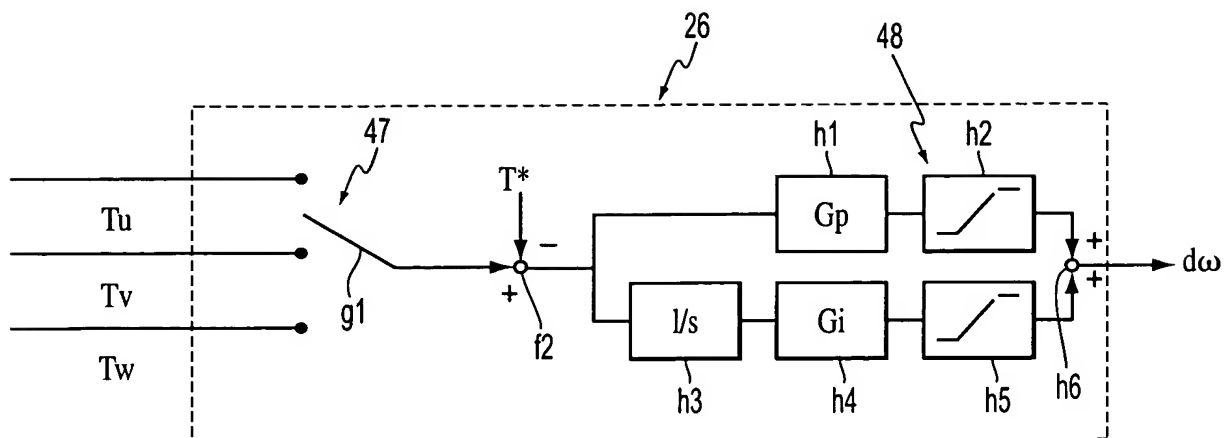


FIG. 11

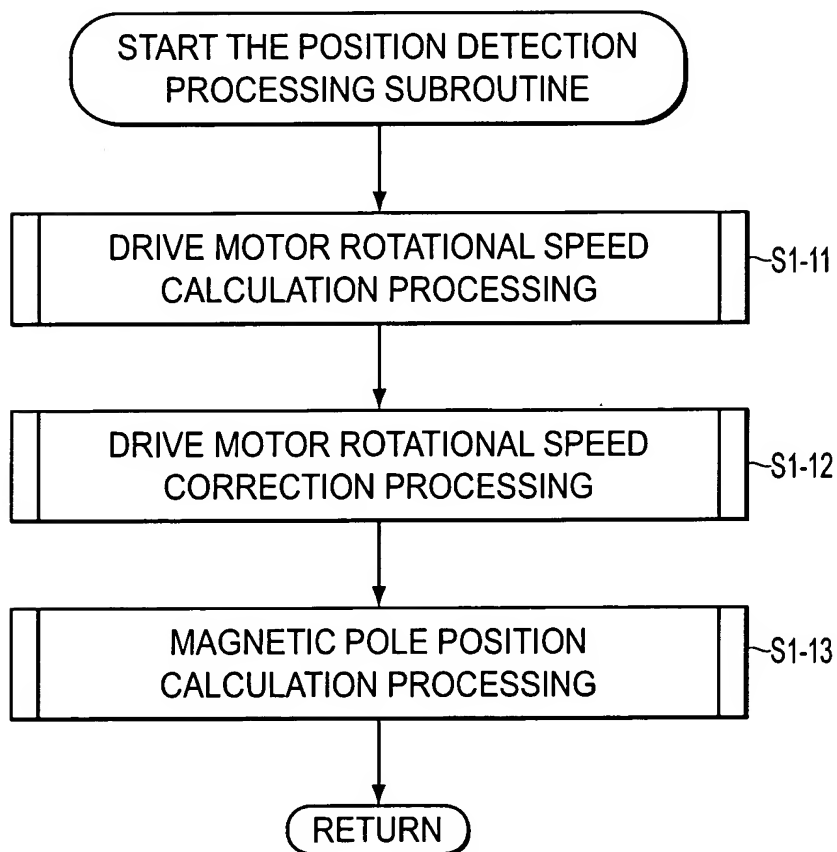


FIG. 12

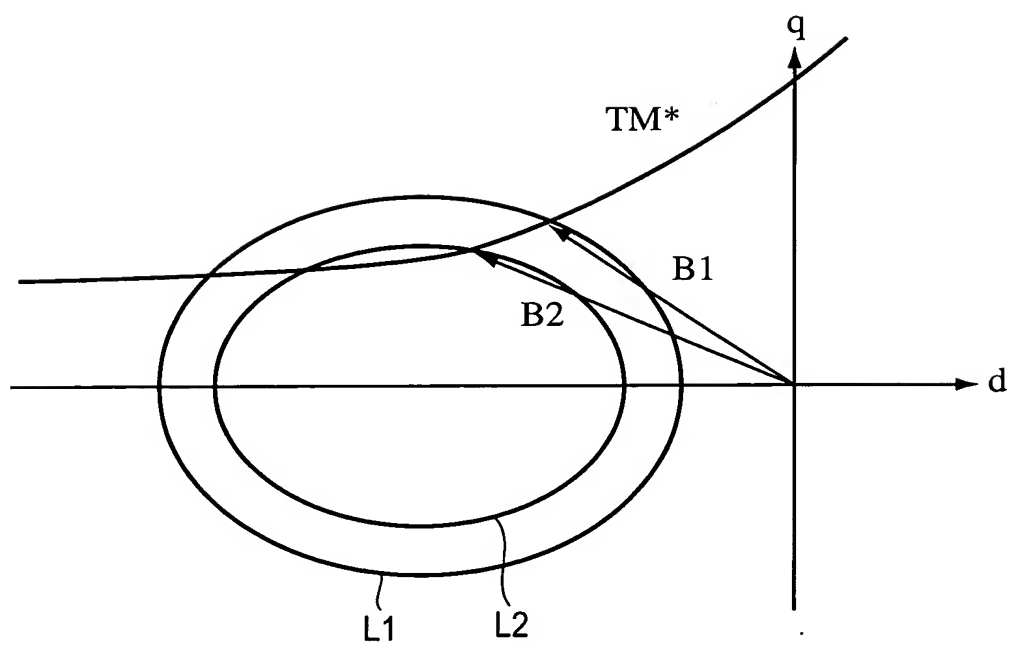


FIG. 13

V <sub>dc</sub> =42	TARGET DRIVE MOTOR TORQUE T <sub>M</sub> * [Nm]										
	0	10	20	30	40	50	60	70	80	90	100
0	0	70	130	190	250	300	360	420	480	540	620
1000	0	70	130	190	250	300	360	420	480	540	620
2000	0	70	130	190	250	300	366	420	480	536	536
3000	0	70	130	190	250	308	377	417	417	417	417
4000	66	60	123	191	258	338	382	382	382	382	382
5000	92	108	155	210	293	401	401	401	401	401	401
6000	130	150	199	251	347	510	510	510	510	510	510
7000	167	170	219	270	409	409	409	409	409	409	409
8000	199	199	245	301	356	356	356	356	356	356	356
9000	224	221	272	322	322	322	322	322	322	322	322
10000	250	227	298	360	360	360	360	360	360	360	360
11000	300	300	300	300	300	300	300	300	300	300	300

FIG. 14

V <sub>dc</sub> =42	TARGET DRIVE MOTOR TORQUE T <sub>M</sub> * [Nm]										
	0	10	20	30	40	50	60	70	80	90	100
0	30	30	30	30	30	30	30	30	30	30	30
1000	30	30	30	30	30	30	30	30	30	30	30
2000	30	30	30	30	30	30	30	30	30	45	45
3000	30	30	30	30	30	34	41	44	44	44	44
4000	76	31	29	38	43	51	54	54	54	54	54
5000	80	69	57	53	57	65	65	65	65	65	65
6000	82	78	68	63	67	75	75	75	75	75	75
7000	83	80	72	67	74	74	74	74	74	74	74
8000	84	82	75	70	72	72	72	72	72	72	72
9000	84	84	77	72	72	72	72	72	72	72	72
10000	85	84	78	75	75	75	75	75	75	75	75
11000	90	90	90	90	90	90	90	90	90	90	90

FIG. 15

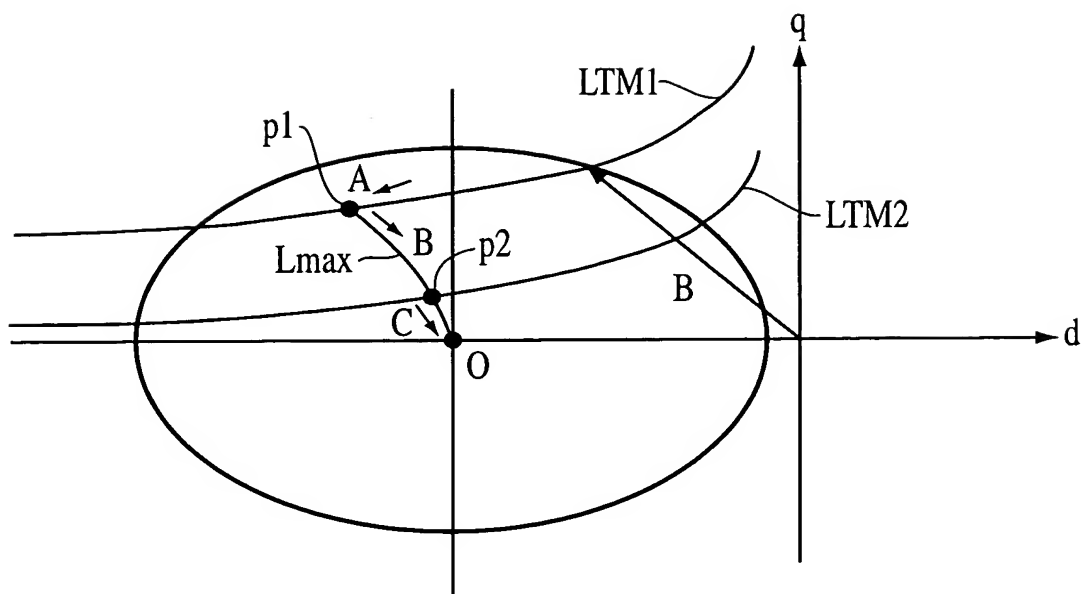


FIG. 16